

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 32969PC01	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/DK2003/000771	International filing date (day/month/year) 07.11.2003	Priority date (day/month/year) 08.11.2002
International Patent Classification (IPC) or national classification and IPC C12N 15/11, 15/62, C07K 14/00, 17/14, G01N 33/68, C07K 19/00		
Applicant University of Copenhagen Panum et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. ☐ (sent to the applicant and to the International Bureau) a total of _____ sheets, as follows:
 - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application |

Date of submission of the demand 08.06.2004	Date of completion of this report 28.01.2005
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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/DK2003/000771

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4)
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☒ the international application as originally filed/furnished

☐ the description:

pages _____ as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ the claims:

pages _____ as originally filed/furnished

pages* _____ as amended (together with any statement) under Article 19

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ the drawings:

pages _____ as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing (*specify*): _____

☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing (*specify*): _____

☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

International application No.

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Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-35	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	1-35	NO
Industrial applicability (IA)	Claims	1-35	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The claimed invention relates to a method for immobilising a protein to the microporous solid zeolite. The polypeptide binds to the zeolite via a polypeptide tag. The polypeptide tag binds to a site of the protein which is situated opposite to the active site of the protein. In this way the active site of the protein is exposed and thereby a high activity of the protein is maintained. Preferably the tag is repeated in order to get a stronger binding. The polypeptide tags having the amino acid sequence SEQ ID NO:1 and SEQ ID NO:2 are also claimed.

This opinion is based on the documents from the international search report. The following documents are considered relevant:

D1: A Corma et al., "Delaminated zeolites: an efficient support for enzymes", Advanced Materials, vol.17, no.1, 2002, pages 71-74. A Corma et al., "Delaminated zeolites: an efficient support for enzymes", Advanced Materials, vol.17, no.1, 2002, pages 71-74.

D2: Brown, "Engineered iron oxide-adhesion mutants of the Escherichia coli phage lambda receptor", Proc.Natl.Acad.Sci., 1992, vol.89, pages 8651-8655.

D3: Brown, "Protein-mediated particle assembly", Nano Letters, 2001, vol.7, pages 391-39

D4: Brown, "Metal-recognition by repeating polypeptides", 1997, vol.15, pages 269-272.

D1 relates to the immobilization of enzymes to a carrier consisting of zeolite. By binding the enzyme to zeolite the enzyme becomes more stable and easier to handle. It is covalently immobilized by reacting the amino groups of the enzyme with anchored aldehyde groups forming imide bonds, which are further reduced to secondary amines (see scheme 1, page 74).

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

The claimed method differs from the method disclosed in D1 in that the polypeptide tag is characterized by amino acid sequence SEQ ID NO:1 or SEQ ID NO:2 and that the tag is repeated when using it for binding the protein to the zeolite carrier.

The technical problem which is solved by the claimed invention is to prepare an immobilized protein to zeolite which has maintained a high activity and whereby the loss of activity is less than 10% (see description page 5, line 19 of the present application). By using the claimed polypeptide tag (SEQ ID NO:1 or SEQ ID NO:2) the orientation of the protein can be controlled so as to expose the active site of the protein to the solvent whereas the opposite site is bound to the tag which is bound to the solid surface. Preferably the tag is repeated in order to get a stronger binding.

The ability of proteins and repeating polypeptide tags to adhere to and distinguish solid surfaces is already known from D2, D3 and D4.

For a person skilled in the art, who is presented with the above mentioned problem, it would however not be obvious to find out that the repeating polypeptides SEQ ID NO:1 and SEQ ID NO:2 are especially suitable as tags when immobilizing a protein to zeolite.

As, however, the present claims fail to define the invention in a definite way, they lack inventive step (see Box VIII).

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

It is clear from the description examples 1-3 on pages 17-20 that the following features are essential to the definition of the invention:

- (1) the microporous material consist of zeolit
- (2) the polypeptide tag has the amino acid sequence SEQ ID NO:1 or SEQ ID NO:2.

Since the claims do not contain these features they do not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

Claims 1,5-6,25-26,32,33 and 35 are not supported by the description as required by Article 6 PCT, as their scope is broader than justified by the description because of the expressions "similar solid surfaces" and "at least 30-100%".

Also, claims 21 -24 do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The claims attempts to define the subject-matter in terms of the result to be achieved which merely amounts to a statement of the underlying problem. The technical features necessary for achieving this result should be added.

The breath of the claims should be such that it represents a reasonable generalisation of the examples provided, and such that it is credible that every compound falling within the scope actually provides a solution to the problem underlying the invention.

Support within the meaning of Article 6 PCT and disclosure within the meaning of Article 5 PCT for claims 1, 5-6 and 21-26 and 32 are to be found only for zeolite and SEQ ID NO:1 and SEQ ID NO:2.